

Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) **EP 0 898 700 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention
of the grant of the patent:
23.01.2002 Bulletin 2002/04

(51) Int Cl.7: **G01N 21/03, B01L 3/14**

(86) International application number:
PCT/IT97/00111

(21) Application number: **97922033.2**

(87) International publication number:
WO 97/43622 (20.11.1997 Gazette 1997/50)

(22) Date of filing: **13.05.1997**

(54) **A TEST TUBE FOR BIOLOGICAL ANALYSES OF ORGANIC LIQUIDS USING
ELECTRO-OPTICAL EQUIPMENT**

PROBENRÖRCHEN ZUR BIOLOGISCHEN ANALYSE ORGANISCHER FLÜSSIGKEITEN UNTER
VERWENDUNG ELEKTRO-OPTISCHEN GERÄTS

EPROUVETTE POUR ANALYSES BIOLOGIQUES DE LIQUIDES ORGANIQUES AU MOYEN D'UN
EQUIPEMENT ELECTRO-OPTIQUE

(84) Designated Contracting States:
**AT BE CH DE DK ES FI FR GB GR IE IT LI NL PT
SE**

• **COCOLA, Francesco**
I-53018 Sovicille (IT)

(30) Priority: **16.05.1996 IT FI960114**

(74) Representative:
Mannucci, Gianfranco, Dott.-Ing. et al
Ufficio Tecnico Ing. A. Mannucci Via della Scala 4
50123 Firenze (IT)

(43) Date of publication of application:
03.03.1999 Bulletin 1999/09

(73) Proprietor: **DIESSE DIAGNOSTICA SENESE**
S.p.A.
I-20123 Milano (IT)

(56) References cited:
EP-A- 0 192 968 WO-A-90/05903
US-A- 4 528 159 US-A- 4 710 874
US-A- 5 128 104

(72) Inventors:
• **RICCI, Antonio**
I-53035 Monteriggioni (IT)

EP 0 898 700 B1

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

Technical Field

[0001] The invention relates to a test tube for biological analyses of organic liquids using electro-optical equipment in general, such as photometers, for example, used for sedimentation velocity (ESR) analyses and the like.

Background Art

[0002] Single-use test tubes are known which are made of synthetic resin and have a tubular structure (for example US4 710 874), as are other types which have a substantially prismatic cavity with a rectangular cross-section, the two larger walls of which are passed through by the rays which allow the electrooptical analysis (for example WO90 059 03).

[0003] An object of the invention is to improve available surfaces for adopting the so-called bar codes used to read data relating to the tests and to the person whose liquids are being analysed considerable amount of time.

[0004] Basically, the test tube in question - having a container body with a liquid-containing cavity defined by walls comprising zones located opposite one another and capable of being passed through by the rays of an optical analysing system, and a connecting part for filling and closing - according to the invention comprises the features defined in claim 1.

[0005] Said laminar zone may be developed symmetrically on opposite sides of the substantially prismatic cavity; the longitudinal edges of said laminar zone and an additional projection located at a distance from said edges may define a volume of the test tube contained and centred in a cylindrical housing; also the said projection may be longitudinally developed along the plane of symmetry perpendicular to said laminar zone.

[0006] The invention also relates to an apparatus as defined in claim 25. The said data reading means are advantageously positioned so as to perform reading in a direction parallel to the walls of the test tube passed through by the rays of the optical analysing system. Each of the seats designed to contain the test tubes has a longitudinal opening designed to allow reading - by the reading means - of a bar code applied onto one of the surfaces of the test tube.

[0007] In any case, the test tube according to the invention offers the possibility of using an ample flat surface for receiving bar codes and other data useful for the operations for which the test tube is used.

Brief Description of the Drawings

[0008] The invention will be more clearly understood with reference to the description and the accompanying drawing, which shows a practical non-limiting embodiment of the invention. In the drawing:

Figs. 1 and 2 show a front and a side view respectively of a test tube according to the invention, partially sectioned;

Figs. 3 and 4 show a section and a view of the test tube on transverse planes indicated by III-III and IV-IV in Fig. 2, respectively;

Figs. 5 to 15 show - similarly to Fig. 3 - possible variants of the test tube. Only the variants of Fig 5, 6 and 8 lie within the scope of claim 1, the other variants are depicted only for the purpose of illustration.

Detailed Description of Preferred Embodiments

[0009] With reference to Figures 1 to 4, the test tube 1 comprises a container body with a cavity 3 which is substantially prismatic and has a substantially rectangular cross-section and with a cylindrical connecting part 5 for filling and closing by means of a stopper not shown in the drawing. The prismatic cavity 3 has, corresponding to the long sides of its cross-section, walls 3A, 3B (Figs. 1 and 3) which are flat and of more or less constant thickness, except for a slight variation of the internal dimension of cavity 3 for removal of the test tube from the manufacturing mould, the test tube being preferably formed using transparent plastic. These walls 3A, 3B are designed to be passed through perpendicularly, in the direction of the arrow F (Fig. 3), by the light rays of an electro-optical analysing system.

[0010] The test tube also comprises a flat laminar zone 7, developed as an extension of one of the walls of the said cavity 3 parallel to the direction F of the rays of the optical analysis system. This flat laminar zone 7 is capable of receiving information which can be read using reading means for example of the optical type, such as a bar code or the like. Advantageously the said laminar zone 7 extends symmetrically on opposite sides of the essentially prismatic cavity.

[0011] In a preferred embodiment, the longitudinal edges 7A, 7B of said laminar zone and an additional longitudinal projection 7C located at a distance from said edges define a volume of the test tube such as to be able to centre the test tube itself inside a cylindrical housing. The said longitudinal projection 7C may be developed along a plane of symmetry perpendicular to said laminar zone 7. All this makes it possible to achieve effective centring of the test tube in the seats provided in the analysing equipment.

[0012] In any case the test tube offers the possibility of using an ample flat surface 7 for receiving bar codes and/or other data useful for the operations for which the test tube is used.

[0013] Figs. 5, 6 and 8 to 15 show cross-sections of further possible embodiments of test tubes which have requirements equivalent to those of the test tube already described. These test tubes have at least one surface capable of receiving the information, such as the surface 7, and a volume contained within a circular profile

(viewed in cross-section); moreover, the containing space of the body of the test tube may be analysed by a beam of rays which pass through it, being defined with flat walls. Figures 7, 9 to 15 are only shown for the purpose of illustration.

[0014] It is understood that the drawing shows only an example provided by way of a practical demonstration of the invention, it being possible to vary the forms and arrangements thereof without thus departing from the scope of the claims. The presence of any reference numbers in the accompanying claims has the purpose of facilitating reading of the claims with reference to the description and to the drawing, and does not limit the scope of protection represented by the claims.

Claims

1. Test tube for biological analyses of organic liquids using electro-optical equipment in general, having a container body with a connecting part for filling and with a liquid containing cavity being lengthwise elongated, prismatic and having an essentially rectangular cross-section with two opposite walls capable of being passed through by the rays of an optical analyzing system movable along the longitudinal development of said cavity, **characterized in that** it comprises a surface formed by a flat laminar zone (7) developed as an extension of one of the other two walls of said cavity and projecting from said two opposite transparent walls in a direction parallel to the direction (F) of the rays of the optical analyzing system, which surface is apt to accommodate optically readable information.
2. Test tube according to Claim 1, **characterized in that** said surface and said container body have, in cross-section, a form contained in a circular volume.
3. Test tube according to Claim 1 or 2, **characterized in that** said laminar zone (7) extends symmetrically on opposite sides of the essentially prismatic cavity (3).
4. Test tube according to Claim 1 or 2 or 3, **characterized in that** the longitudinal edges (7A, 7B) of said laminar zone and an additional projection (7C) located at a distance from said edges define a volume of the test tube contained and centred in a cylindrical housing.
5. Test tube according to Claim 4, **characterized in that** said projection (7C) is longitudinal and is developed along the plane of symmetry perpendicular to said laminar zone (7).
6. Test tube according at least to Claim 1, **character-**

ized in that a bar code is applied onto said surface.

7. Apparatus for carrying out analyses for determining the sedimentation velocity of particles in organic liquids contained in test tubes having extended body and of limited cross-section comprising means for receiving a plurality of test tubes and comprising optical reading means mounted on a slide designed to travel along the test tubes which are housed inside the apparatus, **characterized in that** it comprises on said slide also means for reading data, such as a bar code, located on a surface provided on said test tubes, along the length of the extended body.
8. Apparatus according to Claim 7, **characterized in that** said data reading means are positioned so as to perform reading in a direction parallel to the walls of the test tube which are passed, through by the rays of the optical analysing system.
9. Apparatus according to Claim 7 or 8, **characterized in that** each of the seats designed to contain the test tubes has a longitudinal opening designed to allow reading - by the reading means - of a bar code applied onto one of the surfaces of the test tube.

Patentansprüche

1. Probenröhrchen zur biologischen Analyse von organischen Flüssigkeiten im allgemeinen unter Verwendung von elektrooptischem Gerät, mit einem Behälterkörper mit einem Verbindungsteil zum Füllen und mit einer Flüssigkeit enthaltenden Hohlraum, der sich in Längsrichtung erstreckt, prismatisch ist und einen im wesentlichen rechteckigen Querschnitt hat, mit zwei einander gegenüberliegenden Wänden, durch die die Strahlen eines optischen Analysesystems, welches entlang der Längserstreckung des Hohlraums bewegbar ist, hindurchgeführt werden können, **dadurch gekennzeichnet, daß** es eine Oberfläche aufweist, die durch eine flache, laminare Zone (7) gebildet ist, welche als eine Verlängerung der einen der zwei Wände des Hohlraums entwickelt ist, und an den zwei einander gegenüberliegenden, transparenten Wänden in einer Richtung parallel zur Richtung (F) der Strahlen des optischen Analysesystems vorsteht, wobei die Oberfläche optisch lesbare Information tragen kann.
2. Probenröhrchen nach Anspruch 1, **dadurch gekennzeichnet, daß** die Oberfläche und der Behälterkörper im Querschnitt eine Form aufweisen, die in einem kreisförmigen Volumen enthalten ist.
3. Probenröhrchen nach Anspruch 1 oder 2, **dadurch**

gekennzeichnet, daß die laminare Zone (7) sich symmetrisch an einander gegenüberliegenden Seiten des wesentlichen prismatischen Hohlraums (3) erstreckt.

4. Probenröhrchen nach Anspruch 1, 2 oder 3, **dadurch gekennzeichnet, daß** die Längskanten (7A, 7B) der laminaren Zone und ein zusätzlicher Vorsprung (7C), der in einem Abstand zu den Kanten gelegen ist, ein Volumen des Probenröhrchens definieren, das in einem zylindrischen Gehäuse enthalten und zentriert ist.
5. Probenröhrchen nach Anspruch 4, **dadurch gekennzeichnet, daß** der Vorsprung (7C) sich in Längsrichtung erstreckt und entlang der Symmetrieebene rechtwinklig zur laminaren Zone (7) entwickelt ist.
6. Probenröhrchen nach wenigstens Anspruch 1, **dadurch gekennzeichnet, daß** auf der besagten Oberfläche ein Strichcode aufgebracht ist.
7. Vorrichtung zum Durchführen von Analysen zum Bestimmen der Sedimentationsgeschwindigkeit von Teilchen in organischen Flüssigkeiten, die in Probenröhrchen enthalten sind, welche einen langgestreckten Körper und einen begrenzten Querschnitt haben, mit Mitteln zum Aufnehmen einer Anzahl von Probenröhrchen und mit optischen Datenlesemitteln, die an einer Gleitbahn befestigt sind, die so gestaltet ist, daß sie entlang der Probenröhrchen, die im Inneren der Vorrichtung aufgenommen sind, laufen kann, **dadurch gekennzeichnet, daß** auf der Gleitbahn auch Mittel zum Lesen von Daten, wie beispielsweise ein Strichcode, vorgesehen sind, die an einer Oberfläche, welche auf den Probenröhrchen entlang der Länge des langgestreckten Körpers vorgesehen ist, angeordnet sind.
8. Vorrichtung nach Anspruch 7, **dadurch gekennzeichnet, daß** die Datenlesemittel so positioniert sind, daß ein Lesen in einer Richtung parallel zu den Wänden des Probenröhrchens, durch welches die Strahlen des optischen Analysesystems hindurchgeführt werden, durchgeführt werden kann.
9. Vorrichtung nach Anspruch 7 oder 8, **dadurch gekennzeichnet, daß** jeder der Sitze, der zum Aufnehmen der Probenröhrchen gestaltet ist, eine Längsöffnung hat, die so gestaltet ist, daß sie ein Lesen - durch die Lesemittel - eines Strichcodes, der auf eine der Oberflächen des Probenröhrchens aufgebracht ist, zuläßt.

Revendications

1. Eprouvette pour analyses biologiques de liquides organiques en utilisant un équipement électrooptique de façon générale ayant un corps de récipient avec une partie de liaison pour le remplissage et ayant une cavité renfermant du liquide prismatique, allongée dans le sens de la longueur ainsi qu'une section transversale sensiblement rectangulaire avec deux parois opposées capables d'être traversées par les rayons d'un système d'analyse optique mobile le long de la partie longitudinale de ladite cavité, **caractérisée en ce qu'elle** comprend une surface formée par une zone laminaire plane (7) prévue comme un prolongement de l'une de deux autres parois de ladite cavité et se prolongeant à partir desdites deux parois transparentes opposées dans une direction parallèle à la direction (F) des rayons du système d'analyse optique, laquelle surface est apte à recevoir des informations aptes à être lues optiquement.
2. Eprouvette selon la revendication 1, **caractérisée en ce que** ladite surface et ledit corps de récipient ont en section transversale une forme contenue dans un volume circulaire.
3. Eprouvette selon la revendication 1 ou 2, **caractérisée en ce que** ladite zone laminaire (7) se prolonge symétriquement sur les côtés opposés de la cavité sensiblement prismatique (3).
4. Eprouvette selon la revendication 1 ou 2 ou 3, **caractérisée en ce que** les bords longitudinaux (7A, 7B) de ladite zone laminaire et un prolongement supplémentaire (7C) situé à une distance desdits bords définissent un volume de l'éprouvette contenue et centrée dans un logement cylindrique.
5. Eprouvette selon la revendication 4, **caractérisée en ce que** ledit prolongement (7C) est longitudinal et est prévu le long du plan de symétrie perpendiculaire à ladite zone laminaire (7).
6. Eprouvette selon au moins la revendication 1, **caractérisée en ce qu'un** code barre est appliqué sur ladite surface.
7. Dispositif pour mettre en oeuvre des analyses pour déterminer la vitesse de sédimentation de particules dans des liquides organiques contenus dans des éprouvettes ayant un corps prolongé et de section transversale limitée comprenant un moyen pour recevoir une pluralité d'éprouvettes et comprenant un moyen de lecture optique monté sur un dispositif glissant conçu pour se déplacer le long des éprouvettes qui sont logées à l'intérieur du dispositif, **caractérisé en ce qu'il** comprend sur ledit dis-

positif glissant également un moyen pour lire les données comme un code barre situé sur une surface prévue sur lesdites éprouvettes le long de la longueur du corps prolongé.

5

8. Dispositif selon la revendication 7, **caractérisé en ce que** lesdits moyens de lecture de données sont positionnés afin de réaliser la lecture dans une direction parallèle aux parois de l'éprouvette qui sont traversées par les rayons du système d'analyse optique.

10

9. Dispositif selon la revendication 7 ou 8, **caractérisé en ce que** chacun des moyens de retenue conçus pour contenir des éprouvettes présente une ouverture longitudinale conçue pour permettre la lecture par les moyens de lecture d'un code barre appliqué sur l'une des surfaces de l'éprouvette.

15

20

25

30

35

40

45

50

55

FIG. 1

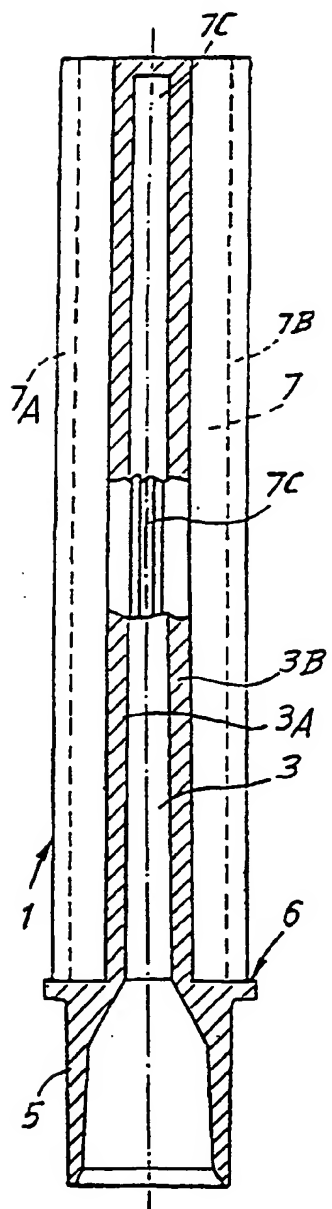


FIG. 2

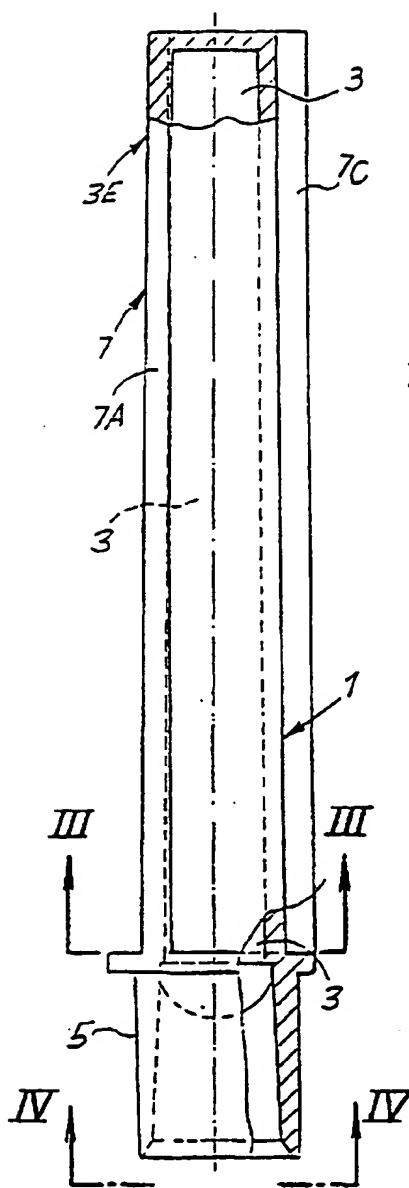


FIG. 3

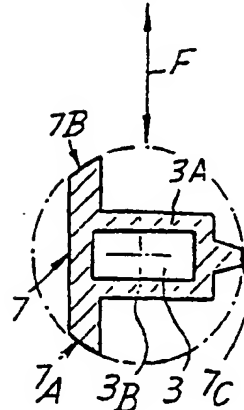


FIG. 4

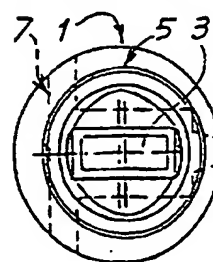


FIG. 5

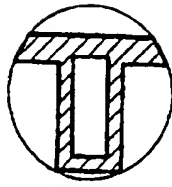


FIG. 6

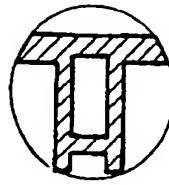


FIG. 7

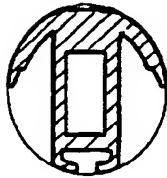


FIG. 8

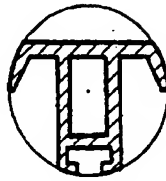


FIG. 9

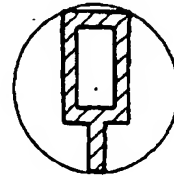


FIG. 10

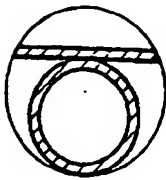


FIG. 11

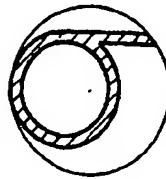


FIG. 12

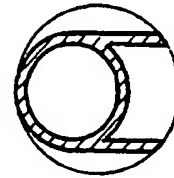


FIG. 13

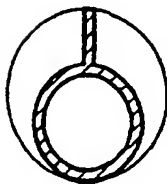


FIG. 14

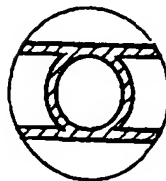


FIG. 15

